

SOCIB HF radar:





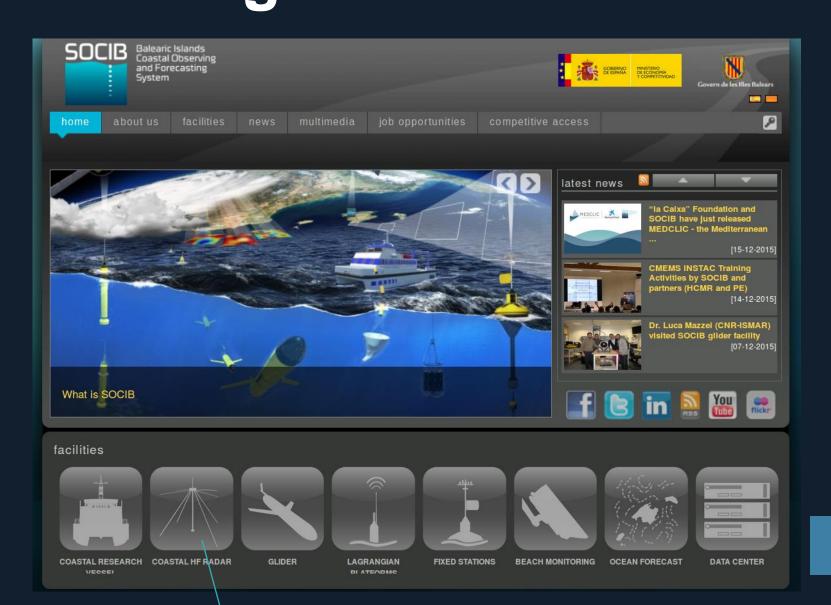
a key contribution to multi-platform ocean observation

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HF radar: synoptic and high resolution observation in coastal environment

SOCIB: a multi-platform integrated ocean observatory [1]



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Total velocities [2]

- Free access via THREDDS
- ➤ Online visualization tools
- ➤ NetCDF CF-1.6 compliant
- ➤ Monthly files

Rotary

80%

spectrum

computed

over the

coverage

Quality controlled on radial and total components

HF Radar facility



Ibiza Channel (IC) HF Radar (HFR) system [2]

Main characteristic of

Mooring

IC HFR system

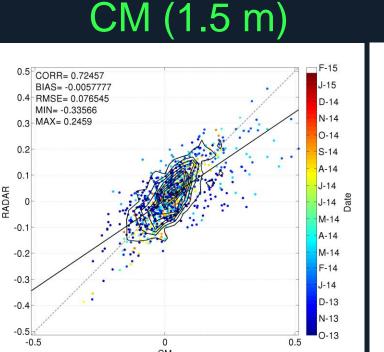
HF radar system	2 CODAR Seasonde
TX center frequency	13.5 MHz
Bandwidth	90 kHz
Radial resolution	1.6 km
Azimuthal discretization	5°
Time sampling	hourly
Combination method	Least Square Method
Grid discretization	3 km
Averaging radius	6 km

Spatial distribution of the temporal coverage (a) and temporal variation of the spatial coverage (b) of total velocities.

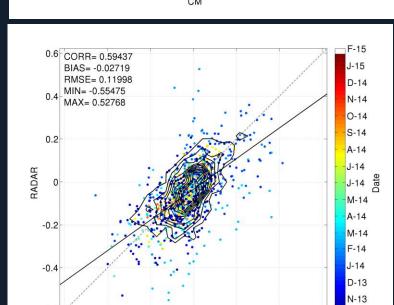
Validation [3]

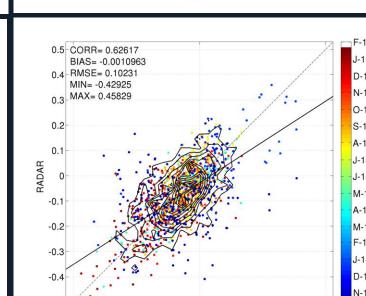
> Assessment of operational HFR total velocities based on comparison with moored current-meter (CM), ADCP and lagrangian drifters.

> HFR total velocities do not sketch significant errors, in agreement with similar studies



ADCP (5 m)





-0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4

Comparison between 6-h averaged HFR and Current-meter or ADCP zonal (U) and meridional (V) velocities

Circulation studies in Ibiza Channel

Variability

computed

coverage

area and

ellipses

over

80%

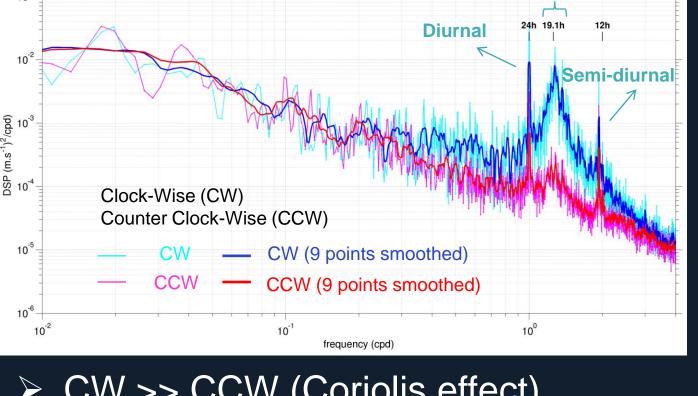
mean

surface

current

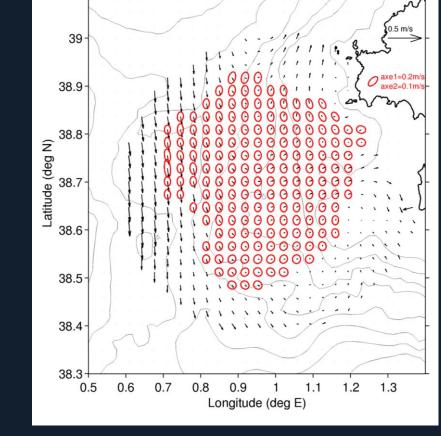
Variability

Rotary spectrum



- > CW >> CCW (Coriolis effect)
- Diurnal, Semi-diurnal and Near-inertial oscillations prevail in IC

Variability ellipses

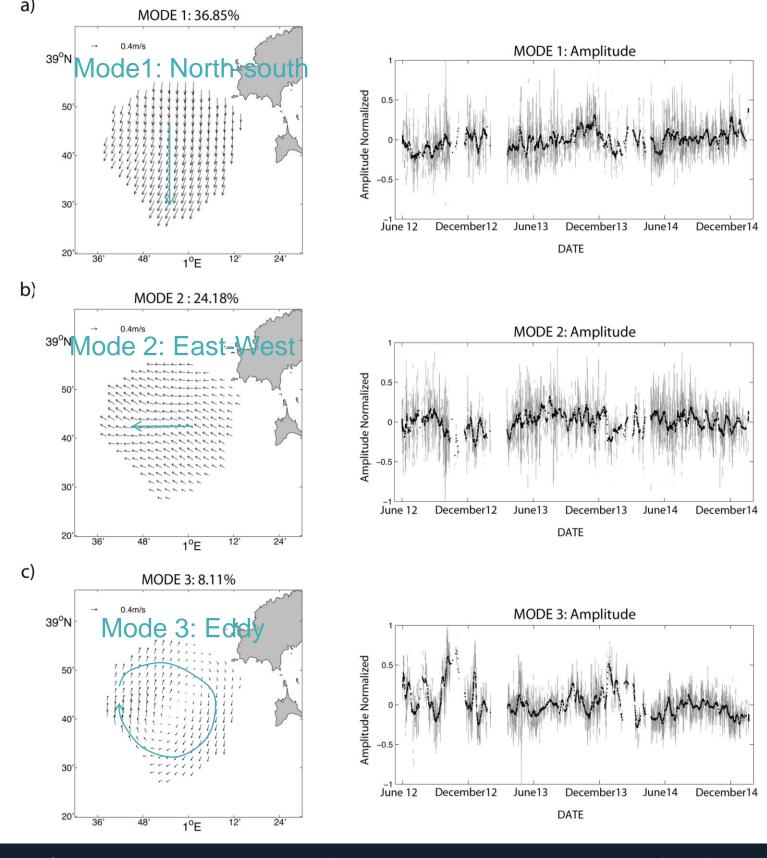


- Northern Current signature in the Western part of IC
- Standard deviation in the range 10 20cm/s
- No dominant variability direction

EOF analysis [3]

Data available more than 85% of the time

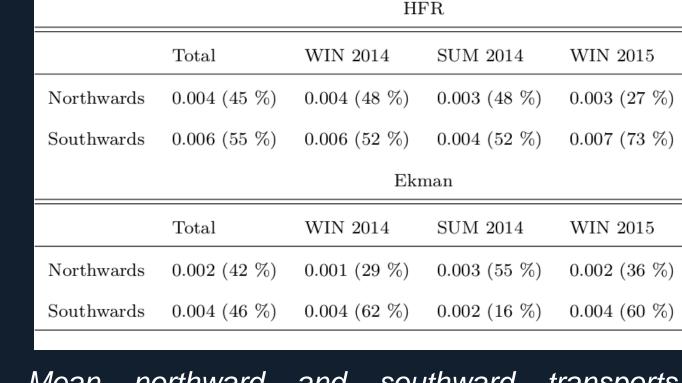
a



EOF decomposition. (a) Mode 1 spatial pattern (left) and its associated normalized hourly (black) and 24-hour smoothed (gray) temporal amplitude (right); (b) idem for Mode 2; (c) idem for Mode 3.

- > 3 first modes: 69% of the total variability
- Modes 1 (37%) and 2 (24%): wind induced variability
- Mode 3 (8%): Eddy pattern not directly wind-induced

Cross-channel surface transport [3]



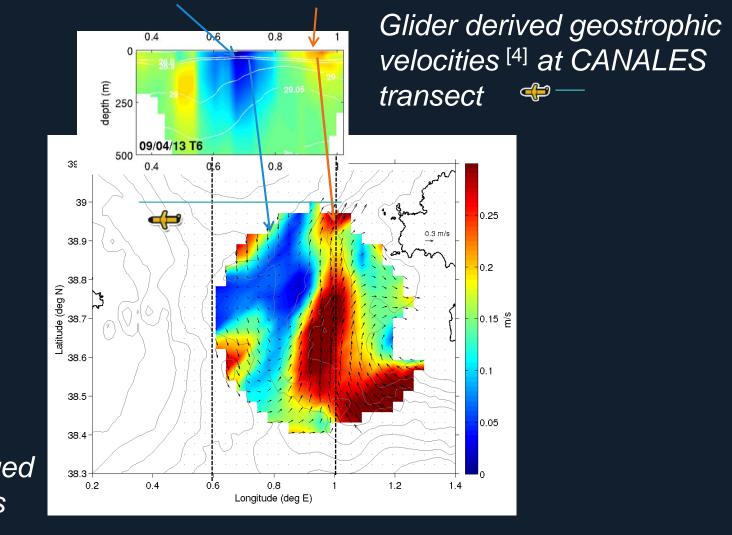
Mean northward and southward transports calculated by the use of HFR and Ekman currents, for full and for summer (SUM) corresponding to July-August-September (JAS) and for winter (WIN) corresponding to November-December-January (NDJ), for the first surface meter, and for a transect of 51 km in the Ibiza Channel. Transport in Sv (10⁶ m³/s). Percentage of data involved for each direction is given between parenthesis. Periods with null windinduced transport are between 4% and 29% of the time for WIN and SUM respectively.

- Assessment of wind induced (Ekman) transport
- Between 25% and 50% of the total surface transport depending on the wind intensity
- High seasonal variability (higher in winter)
- Mainly southwards

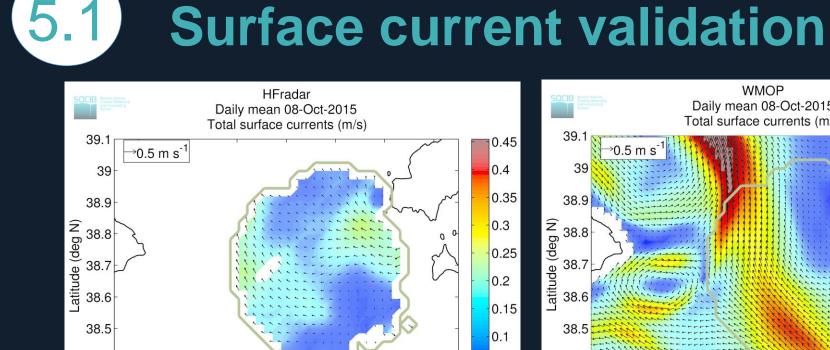
Geostrophic current

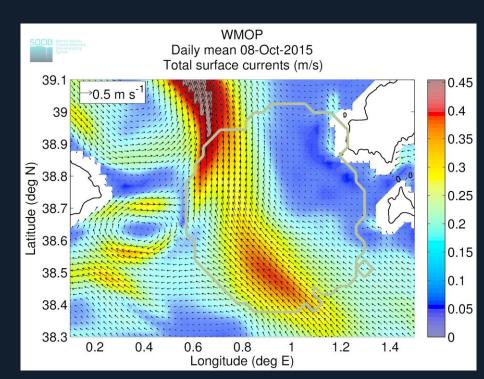
- In general, good agreement between HFR surface velocities and GLIDER derived geostrophic velocities
- ➤ Surface currents ≈ geostrophic currents
- Except in case of high wind events

Daily averaged HFR velocities



Operational





Maps of HFR total velocities (left), operational simulated surface velocities (right) in m/s as a part of WMOP operational validation procedure (in progress).

> HFR total velocities are used to perform operational validation of the SOCIB high resolution Western Mediterranean OPerational model (WMOP) [5]

Model validation

Long-term

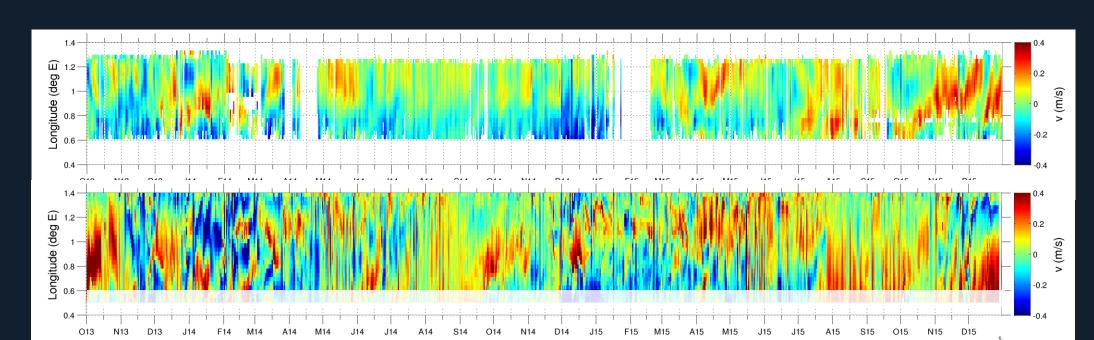


Hovmuller (38.7°N)

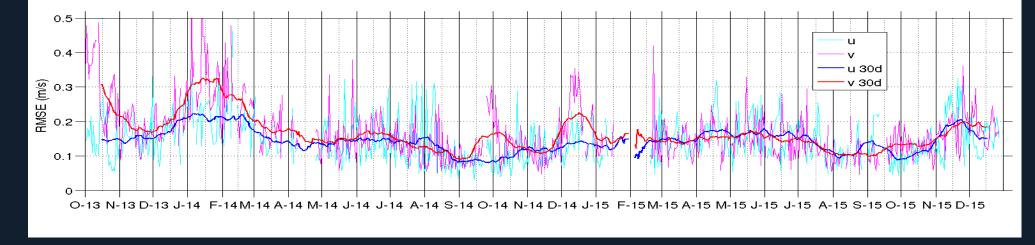
- > General overestimation of the current intensity in WMOP (maximum values aprox. 30% higher).
- > Problems in WMOP current direction can occur (e.g. Oct.2013)
- No permanent and synoptic patterns for model.
- > Short spatial and temporal scales with poor pattern correspondence.
- > Seasonal variability for both data sets (high variability in winter, low variability in summer).

6.2 **Statistics**

- > RMSD are higher for V-component before year 2015
- Seasonal variability of RMSD (higher in winter)
- Related to the seasonal variability of surface velocities



Temporal evolution of HFR (top) and WMOP (bottom) daily averaged V-component along the transect at 38.7°N across the IC.



Temporal evolution of Root Mean Square Difference (RMSD) for U and V components computed over the 80% coverage area. Daily (thin lines) and 30 day averaged are shown.

Conclusions

- > 3.5 years continuous monitoring of surface current in Ibiza Channel (since June 2012)
- > Good agreements between in situ and HFR derived velocities
- Complex circulation mapped by HFR in the IC
- Significant cross-channel transport is wind-induced

Main variability of surface current related to wind

- > HFR velocities are used to validate model in coastal
- environment Development of methodologies to use radial velocities
- > Toward HFR velocities data assimilation

REFERENCES

[1] Tintoré et al. (2013), Mar. Tech. Soc. J. [2] Lana et al. (2015), Sea Technology [3] Lana et al. (2016), Ocean Dyn., in revision

[4] Heslop et al. (2012), Geophys. Res. Lett. [5] Juza et al. (2016), J. Oper. Oceanogr.

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